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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/817,140

04/02/2004

Ki-Ho Baik

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EXAMINER

RAYMOND, BRITTANY L

ART UNIT

PAPER NUMBER

1795

MAIL DATE

DELIVERY MODE

07/10/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/817,140	Applicant(s) BAIK ET AL.	
	Examiner BRITTANY RAYMOND	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 April 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6,8,9,11-13 and 15-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6,8,9,11-13 and 15-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 4/2/2004 & 5/7/2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
2. Claims 1-6, 8, 9, 11-13 and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kirkpatrick (U.S. Patent Application 2006/0084229) in view of Itoh (U.S. Patent Application 2004/0058279).

Kirkpatrick discloses a method for fabricating a semiconductor device comprising: depositing and patterning a photoresist layer over a substrate (Paragraph 0038) and subjecting the developed substrate (See Figures 3A-3F) to a vacuum ranging from $1e^{-3}$ Torr to $1e^{-8}$ Torr (Paragraph 0039), which is equal to 1 mTorr to $1e^{-5}$ mTorr and is within the range recited in claim 1 of the present invention. Kirkpatrick also discloses that the time the substrate is held in the vacuum ranges from 2 minutes to 60 minutes and the temperature of the vacuum may range from 20 degrees Celsius to five

degrees less than the glass transition temperature of the photoresist used (Paragraph 0039), which are within the ranges recited in claims 1, 2, 3, 8, 9, 11 and 15 of the present invention.

Kirkpatrick fails to disclose that the imaged photoresist can be exposed to a vacuum prior to development, and the type of radiation used during imaging.

Itoh discloses a pattern formation method comprising: providing a substrate coated with a chromium film and a resist on top (Paragraph 0057), baking the substrate for ten minutes (Paragraph 0058), writing on the resist film with an electron beam writing apparatus (Paragraph 0058), post exposure baking the substrate for fifteen minutes and developing the resist film (Paragraph 0060), as recited in claims 1, 8, 9 and 15 of the present invention. Itoh discloses that the substrate is left to stand in a vacuum after the writing step (Paragraph 0065), which is before the post exposure baking and developing steps, as recited in claims 1, 6, and 9 of the present invention. Itoh also discloses that along with the electron beam radiation, used in the process above, ultraviolet radiation, which is a type of optical radiation, can be used to pattern a resist, as recited in claims 4, 5, 12, 13, 16, and 17 of the present invention.

It would have been obvious to one of ordinary skill in the art, at the time of invention by applicant, to have performed the vacuum exposure step of Kirkpatrick prior to development, as suggested by Itoh, because Itoh teaches that performing the photolithographic process in a specific order allows for a more accurate resist pattern to be formed according to the desired dimensions. It would have also been obvious to have used electron beam or optical radiation, as suggested by Itoh, because Itoh

teaches that these are commonly used in patterning resists and they also help to efficiently produce a desired pattern size.

Response to Arguments

3. The declaration filed on 4/3/2008 under 37 CFR 1.131 has been considered but is ineffective to overcome the Kirkpatrick reference.

The declaration under 37 CFR 1.131 is not commensurate in scope with the claims for several reasons. First of all, there is no pressure given in the evidence, which shows that the pressure of the system may not have been important at the time the Invention Alert Form was created. In addition to this, the time ranges recited in claims 1, 3, 8, 9, 11 and 15 of the present invention and the temperature ranges recited in claims 2, 3, 8, 9, 11 and 15 of the present invention are outside of the ranges provided in the evidence. Therefore, the times and temperatures outside of the ranges given in the evidence were not a part of the invention at the time the Invention Alert Form was written. Finally, the temperature ranges were discussed in the Invention Alert Form, however they are not recited in claim 1 of the present invention. This shows that a different idea from that of the present invention may have been presented in the Invention Alert Form.

4. Applicant's arguments filed, 4/3/2008, have been fully considered but they are not persuasive.

Applicant argues that the vacuum in Itoh is not being used to affect the size of the photoresist pattern, but rather that the dissolution inhibiting groups in the photoresist are causing this change. While this may be the case, Itoh teaches that after exposure

of the photoresist layer, the photoresist is allowed to stand in a vacuum so that the dissolution inhibiting groups can react with one another to form a pattern with accurate critical dimensions. In other words, the photoresist is left to stand in a vacuum after exposure, so that the imaged critical dimensions can equilibrate, as recited in the present invention. This means that it could be possible that the vacuum still has an effect on the critical dimensions of the photoresist pattern. Also, applicant argues that a vacuum is not even applied to the substrate of Itoh after exposure. This is the case because the exposure takes place under a vacuum and there is no need for a separate step of applying a vacuum to the exposed substrate since it is already in a vacuum.

Applicant also argues that there is no indication of the amount of vacuum that is applied to the photoresist during the process of Itoh. The pressure range recited in the claims is very large and it would be known to one of ordinary skill in the art that these pressures are common for vacuums used in the formation of semiconductor devices. It is even admitted in Applicant's arguments that the vacuum applied is within the range of vacuum pumps generally available for use within the semiconductor industry. The Kirkpatrick reference has also been combined with Itoh to show that vacuums with pressures in the range of the present invention can be used to form an accurate photoresist pattern on a substrate.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRITTANY RAYMOND whose telephone number is (571)272-6545. The examiner can normally be reached on Monday through Friday, 8:30 a.m. - 5:00 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1795

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mark F. Huff/
Supervisory Patent Examiner, Art Unit 1795

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